

Commonwealth of Kentucky
Division for Air Quality
PERMIT STATEMENT OF BASIS

Significant Revision Issued Under 401 KAR 52:020

VF-03-001

CELANESE, INC.

CALVERT CITY, KENTUCKY 42029

June 13, 2003

REVIEWER: ALI IMAM

Plant I.D. # 21-157-00055

Application Log # 55706

SOURCE DESCRIPTION:

The source produces polyvinyl alcohol (PVOH) using vinyl acetate, methanol, sodium hydroxide, and a peroxide catalyst. Acetic acid is produced as a byproduct. The PVOH plant is divided into sections described below.

- i. Polymerization (Poly) Area: Vinyl acetate is continuously polymerized to polyvinyl acetate. The reaction uses methanol and various peroxide compounds.
- ii. Tank Farm: The area consists of approximately 30 tanks that hold the raw materials and intermediate process streams.
- iii. Saponification (SAP) Area: polyvinyl acetate is converted to polyvinyl alcohol using sodium hydroxide as a catalyst.
- iv. Wedco Area: This area dry grinds the final product.
- v. Filling Area: The product is stored in a series of silos and bagged.
- vi. Acetic Acid Recovery (AAR) Unit: The mother liquor (mixture of methanol and methyl acetate) from SAP area is sent to this unit. Here the methanol is extracted and recycled. Methyl acetate is converted to acetic acid in ion exchange beds. The acetic acid is then separated, de-watered, and sent out as final product.

The facility is currently under review for a source wide Title V Operating Permit.

COMMENTS:

Significant Revision, Log # 55706

This permit application is for the installation of two (2) new truck bulk loading stations and modification of Emission Point No. W33 (063) Bagging operation to accommodate filling bulk bags instead of fifty (50) pound bags at the Celanese – Calvert City facility. The new loading stations are The North Bulk Truck Station EPN W37 (067) and The South Bulk Truck Station EPN W38 (068). The North Bulk Truck Station will accommodate loading from the finished product silos 1 through 4 and the existing bagging hopper. The South Bulk Truck Station will accommodate loading from the finished product silos 15 through 17.

Type of control:

Baghouses and dust collector devices are utilized to control PM emissions from the loading and bagging operations.

Emission Estimates Methodology:

Methodology for Estimating Particulate Emissions from Filter Units:

Step 1: Determine the maximum capacity (pounds/hour).

Step 2: Determine the average weight % less than 140 microns.

Used 1999 internal laboratory results for % PVOH through a 100-mesh screen.

Step 3: Determine the average weight % less than 5 microns. Particulate matter smaller than 5 microns is not expected to be emitted. The results are based on the samples sent to the off-site laboratory to obtain the particle size distribution of particles less than 5 microns using a Horiba laser diffraction system. The results are provided in Table 1.

Table 1

Sample Identification	Particle Size Distribution < 5 microns (%)
V-103	2.3
V-305	1.6
Average	1.95

Step 4: Determine the throughput (pounds/hour) less than 5 microns.

$$\text{Throughput} < 5 \text{ um (pounds/hour)} = \text{Step1} \times \text{Step2} \times \text{Step3}$$

Step 5: Determine the uncontrolled emission rates (pounds/hour and tons/year)

$$\text{UER (pounds/hour)} = \text{Step 4}$$

$$\text{UER (tons/year)} = \text{Step 4} \times \{ \text{Maximum Annual Throughput} / \text{Maximum Hourly Rate} \} / 2000$$

Where UER = Uncontrolled Emission Rate

Step 6: Determine the controlled emission rates (pounds/hour and tons/year).

$$\text{CER (pounds/hour)} = \text{Step 4} \times \{ 1 - (\text{CE}/100) \}$$

$$\text{CER (tons/year)} = \text{Step 4} \times \{ \text{Maximum Annual Throughput} / \text{Maximum Hourly Rate} \} / 2000 \\ \times \{ 1 - (\text{CE}/100) \}$$

Where CER = Controlled Emission Rate

CE = Control Efficiency = 99.6 %

Methodology for Estimating Methyl Acetate and Methanol:

1. The total methyl acetate and methanol lost was determined by comparing in process measurements versus final lot. See Table 2 for the comparison.

Table 2

Parameter	In-Process Analysis (%)	Final Product Analysis (%)	Lost During Process (%)
Methyl Acetate	0.076	0.0608	20
Methanol	0.44	0.428	3

2. To distribute the methyl acetate and methanol among all of the impacted VEDCO vents, the Traveler's Rest Study was used. Using Model 1, the theoretical pounds of methanol lost per pound of methanol in the product was calculated. This involved measuring the temperature of each transfer. This yields a tendency for methanol to be lost in each vent.
3. The points were then grouped into four (4) areas that comprised the solids handling area: Unground Silos, WEDCO Lines, Ground Silos, also Final Product Loading. An average tendency to lose methanol in each area of the four areas was calculated.
4. The configuration of the grinding area consists of one unground silo vent, two WEDCO vents, one ground silo vent, and one loading vent. The tendency values are 0.03 for the unground silo vent, 0.08 for the WEDCO vents, 0.05 for the ground silo vent, and 0.05 for the loading vent.
5. By summing the tendencies, the percentages lost in each area can be calculated. This yields 14% in the unground silos, 38% in WEDCO, 24% in the ground silos and 24% in the loading areas.
6. The actual percentage of the methyl acetate and methanol in the final product lost in a given area can be obtained by multiplying the total percent lost across the entire grinding area by the percent of the total lost in any given area. See Table 3 for a summary of the results.

Table 3

Area	Methyl Acetate as a % of Methyl Acetate in Final Product	Methanol as a % of Methanol in Final Product
Unground Silo	2.90%	0.40%
WEDCO	7.60%	1.10%
Ground Silo	4.80%	0.75%
Bagging	4.80%	0.75%
Bulk Loading	4.80%	0.75%

7. The PVOH final product specification for organic material is 15. The emission estimate assumes methyl acetate is 0.33 % and the methanol is 0.67%.

The hourly emission rate is calculated as follows:

$$\text{MeAc Emissions} = (\text{Maximum Capacity}) \times [\# \text{ MeAc} / \# \text{ PVOH}] \times (\% \text{ MeAc Lost in Area})$$

$$\text{MeOH Emissions} = (\text{Maximum Capacity}) \times [\# \text{ MeOH} / \# \text{ PVOH}] \times (\% \text{ MeOH Lost in Area})$$

The annual emission rate is calculated as follows:

$$\text{MeAc Emissions} = [(\text{Maximum Annual Throughput} / \text{Maximum Capacity}) \times (\# \text{ MeAc} / \# \text{ PVOH}) \times (\% \text{ MeAc Lost in Area})] / 2000$$

$$\text{MeOH Emissions} = [(\text{Maximum Annual Throughput} / \text{Maximum Capacity}) \times (\# \text{ MeOH} / \# \text{ PVOH}) \times (\% \text{ MeOH Lost in Area})] / 2000$$

Where MeAc = Methyl Acetate and MeOH = Methyl Alcohol

EMISSION AND OPERATING CAPS DESCRIPTION:

The projected loading rate at each bulk loading station is 50,000 pounds per hour. The emission estimates are based on 24/7/52 operation at each bulk loading station; however, the annual throughput has been limited to 150,000,000 pounds of finished product at each bulk loading station. The overall loading rate from both the South and North Bulk Truck Stations will be limited to 100,000 pounds per hour.

The total production at the facility is not changing, whereas the method of loading of finished product for shipment has been modified. There will be no increase in annual emissions. However, the instantaneous emission rates will be increased which is shown in the Emission Summary.

Emission Summary

Table 1: Emission Estimates for Existing Facilities

Emission Point	Particulate (< 5 um)		Methyl Acetate		Methanol/VOC	
	Pounds/ Hour	Tons/Year	Pounds/ Hour	Tons/Year	Pounds/ Hour	Tons/Year
Bulk Loading - Rail (EPN W29)	0.15	0.66	5.70	24.98	1.81	7.92
Bagging -Bag Filling (EPN W33)	0.0038	0.017	0.14	0.62	0.046	0.20
Bagging -Bagging Filling (EPN W33)	0.13	0.55	4.75	20.81	1.51	6.60
North Truck Station (EPN W37)	---	---	---	---	---	---
South Truck Station (EPN W380)	---	---	---	---	---	---
TOTAL	0.28	1.23	10.59	46.41	3.37	14.72

Table 2: Emission Estimate for Modified Facilities

Emission Point	Particulate (< 5 um)		Methyl Acetate		Methanol/VOC	
	Pounds/ Hour	Tons/Year	Pounds/ Hour	Tons/Year	Pounds/ Hour	Tons/Year
Bulk Loading - Rail (EPN W29)	0.15	0.32	5.70	11.88	1.81	3.77
Bagging -Bag Filling (EPN W33)	0.21	0.021	7.92	0.79	2.51	0.25
Bagging -Bagging Filling (EPN W33)	0.13	0.27	4.75	9.98	1.51	3.17
North Truck Station (EPN W37)	0.21	0.32	7.92	11.88	2.51	3.77
South Truck Station (EPN W38)	0.21	0.32	7.92	11.88	2.51	3.77
TOTAL	0.91	1.25	34.19	46.41	10.85	14.72

CREDIBLE EVIDENCE:

This permit contains provisions, which require that specific test methods, monitoring or record keeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has not incorporated these provisions in its air quality regulations.